

Claims 1 and 3-6 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Although the Office Action did not specifically identify the type of rejection, it appears that the claims were rejected under 35 U.S.C. § 112, second paragraph. The Office Action rejected claim 1 because "assist torque" recited on line 14 did not appear to have antecedent basis in the claims. The Applicants traverse the rejection and respectfully submit that "assist torque" has antecedent basis in claim 1, line 11. As such, claim 1, as it is currently written, is definite. Therefore, the Applicants respectfully request withdrawal of the rejection of claim 1.

With respect to the rejection of claims 3-5, the Applicants have amend claims 3-5 responsive to the rejection.

Claim 6 was rejected because it appeared that the "the peripheral surface" recited in line 3, and "the screw" recited in line 6 did not have antecedent basis in the claims. The Applicants traverse the rejection and respectfully submit that "the peripheral surface" has antecedent basis in claim 1, line 4, and "the screw" has antecedent basis in claim 1, line 5. As such, the Applicants respectfully request withdrawal of the rejection of claim 6. The Applicants further submit that all claims are now in compliance with U.S. patent practice.

Claims 1-4 were rejected under 35 U.S.C. §102(b) as being anticipated by Joshita (U.S. Patent No. 5,971,094). The Applicants traverse the rejection and respectfully submit that claims 1-4 recite subject matter that is neither disclosed nor suggested by Joshita.

Claim 1 recites an electric power steering apparatus for a vehicle comprising a rack shaft extending in a transverse direction of the vehicle. The rack shaft has a rack of gear teeth formed at a portion of a peripheral surface of one end portion thereof and an externally threaded screw formed at a portion thereof excluding the one end portion on which the rack is formed. A pinion meshes with the rack and is adapted to be rotated to reciprocate the rack shaft in a longitudinal direction thereof. A ball-screw mechanism has balls and a nut threadedly engaged with the screw via the balls. An electric motor generates an assist torque corresponding to a steering torque. The motor has a hollow motor shaft extending around the rack shaft and connected to the nut such that the assist torque generated by the electric motor is transmitted from the motor shaft via the nut to the rack shaft. The nut is disposed between the rack and the electric motor.

As a result of the claimed invention, the nut of the ball-screw mechanism is assembled in the electric power steering apparatus before the motor shaft is connected to the nut. This arrangement ensures that after the electric motor undergoes a quality inspection and performance test, the rack shaft and ball-screw mechanism can be assembled with the electric motor, while keeping the motor assembled. The apparatus of the present invention can therefore be easily assembled and retain a high assembling accuracy. The Applicants submit that the prior art fails to disclose or suggest the claimed invention, and therefore, fails to provide the critical and non-obvious advantages that are provided by the invention.

Joshita discloses an electric power steering device 1 including a steering torque transmission shaft 3 which rotates by operating a steering wheel (not illustrated), a

pinion 3a formed at one end of the steering torque transmission shaft 3, and a rack 4 engaged with the pinion 3a. Each of the ends of the rack 4 is joined to the vehicle's wheels. See Fig. 1 of Joshita. A motor 8 is provided so as to cover the rack 4 protruding from a pinion housing 30 which covers the pinion 3a. A screw mechanism 10 for transmitting the torque of the motor 8 to the rack 4 has a ball screw shaft 61, which is monolithically formed on the outer circumference of the rack 4. A ball nut (rotary element) 63 is screwed on the ball screw shaft 61 via a ball 62.

With respect to claim 1, from which claims 2-4 depend, the Applicants respectfully submit that Joshita fails to disclose the claimed features of the invention. Claim 1 recites that the nut is disposed between the rack and the electric motor. In contrast, Joshita discloses that the ball nut 63 in the screw mechanism is disposed on a side of the motor opposite from the portion of the rack 4 which engages the pinion 3a. As such, the ball nut 63 in Joshita is not disposed between the portion of the rack 4 that engages the pinion 3a and the motor 8. See Figs. 1, 2 and 5 of Joshita. Accordingly, Joshita fails to disclose each and every feature of the invention as recited in claim 1, and therefore claims 2-4.

According to U.S. patent practice, a reference must teach every element of a claim in order to properly anticipate the claim under 35 U.S.C. §102. In addition, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. V. Union oil Co. of California*, 814 F.2d 628,631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The Applicants respectfully submit that as Joshita does not disclose that a nut is

disposed between the rack and the electric motor, the reference does not anticipate claims 1-4, nor are claims 1-4 obvious in view of Joshita.

Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over Joshita in view of Onodera et al. (U.S. Patent No. 6,186,268 B1, "Onodera"). As a preliminary matter, there appears to be a typographical error in paragraph 3A of the Office Action in that the patent number for Onodera is incorrect. The Applicants note that the Notice of References Cited identifies the patent number for Onodera as US 6,186,268. Joshita was cited for disclosing many of the claimed elements of the invention, with the exception of a motor including a commutator and brushes. Onodera was cited for curing this deficiency. The Applicants traverse the rejection and respectfully submit that claim 5 recites subject matter that is neither disclosed nor suggested by the combination of Joshita and Onodera.

Onodera discloses an electric power steering unit including a rack-shaft 2, and electric motor 1 coaxially arranged around the rack-shaft 2. A ball screw mechanism for connecting a nut section 19 with a screw section 30 of the rack-shaft 2 is disposed at one end thereof. A coupling section 6 is arranged on an opposite end of the rack-shaft 2 for coupling the rack-shaft 2 with the steering column 5 of the vehicle. In the coupling section, a pinion (not shown) is arranged on the steering column 5 and the teeth of the rack are engaged with each other so that the rotary motion of the steering column is converted into a reciprocative motion of the rack-shaft 2.

Claim 5 depends from claim 1. As discussed above, Joshita fails to disclose each and every feature of the invention as recited in claim 1 in that the reference does not disclose or suggest that a nut is disposed between the rack and the electric motor.

Onodera fails to cure this deficiency in Joshita as Onodera also does not disclose that the nut 19 is disposed between the teeth of a rack arranged on an outer side portion of the rack-shaft 2 and the motor 1. Accordingly, the combination of Joshita and Onodera fails to disclose or suggest each and every feature of the invention as recited in claim 1, and therefore, dependent claim 5.

Claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Joshita in view of Sugino et al. (U.S. Patent No. 5,927,429, "Sugino"). Joshita was cited for disclosing many of the claimed elements of the invention with the exception of a rack guide. Sugino was cited for curing this deficiency. The Applicants traverse the rejection and respectfully submit that claim 6 recites subject matter that is neither disclosed nor suggested by the combination of Joshita and Sugino.

Sugino discloses an electric power steering apparatus having a rack guide mechanism 50 provided centrally of the position of maximum engagement between the pinion 4 and the rack shaft 5, and a dish 75 provided at an intermediate portion of the rack shaft 5. The rack teeth 5a engage the pinion 4. Along the rack shaft 5, a ball screw 9 having a nut 71 is disposed on one side of an electric motor 8, and a rack-and-pinion mechanism 3 is disposed on the other side of the motor 8.

With respect to claim 6, the Applicants respectfully submit that the combination of Joshita and Sugino fails to disclose the claimed features of the invention. Claim 6 depends from claim 1. As discussed above, Joshita fails to disclose each and every feature of the invention as recited in claim 1 in that the reference does not disclose or suggest that a nut is disposed between the rack and the electric motor. Sugino fails to cure this deficiency in Joshita as Sugino discloses that a nut 71 is disposed on a side of

the motor 8 opposite from the portion of the rack shaft 5 which engages with the pinion 4. Thus, the nut 71 in Sugino is not disposed between the motor 8 and the rack teeth 5a. See Fig. 2 of Sugino. Accordingly, the combination of Joshita and Sugino fails to disclose or suggest each and every feature of the invention as recited in claim 1, and therefore, dependent claim 6.


The Applicants respectfully submit that as the combinations of Joshita and Onodera and Joshita and Sugino do not disclose or suggest all of the claimed features of the invention as recited in claim 1, the Office Action has failed to establish a *prima facie* case of obviousness for purposes of a rejection of dependent claims 5 and 6 under 35 U.S.C. §103.

Claims 1-6 are pending. Claims 2-6 depend from claim 1. The Applicants respectfully submit that claims 2-6 are allowable for their dependency from allowable base claim 1, as well as the additional subject matter recited therein. As discussed above, the Applicants respectfully submit that claims 1-4, are not anticipated or obvious in view of Joshita. Also, claims 5 and 6 are not obvious in view of Joshita and Onodera or Joshita and Sugino, respectively. As such, the Applicants respectfully request allowance of claims 1-6 and the prompt issuance of a Notice of Allowability.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the Applicant's undersigned attorney at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300, **referencing docket number 101154-00009.**

Respectfully submitted,



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Enclosure: Marked-Up Copy of Original Claims 3-5

MARKED-UP COPY OF THE ORIGINAL CLAIMS

3. (Amended) The electric power steering apparatus according to claim 2, wherein the connection includes a torque limiter acting between the motor shaft and the nut to release [the] an engagement between the motor shaft and the nut when subjected to a torque larger than a predetermined value.

4. (Amended) The electric power steering apparatus according to claim 3, wherein the torque limiter comprises a split ring of resilient material having a plurality of engagement rings [rigs] extending axially of the split ring and formed on an outer peripheral surface of the split ring at equal intervals in [the] a circumferential direction of the split ring, the engagement ribs being normally in friction engagement with an inner peripheral surface of the nut and being resiliently deformable in a radial inward direction of the split ring when subjected to the torque larger than the predetermined value.

5. (Amended) The electric power steering apparatus according to claim 1, wherein the electric motor includes a commutator [(59)] attached to the motor shaft and having a brush-contact surface [(59a)], and brushes being in slide contact with the brush-contact surface of the commutator, the brush-contact surface extending in a plane perpendicular to [the] an axis of the motor shaft.